MATERIAL SAFETY DATA SHEET

SRM Supplier: National Institute of Standards and Technology
Standard Reference Materials Program
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Gaithersburg, Maryland 20899

SRM Number: 3131a
MSDS Number: 3131a
SRM Name: Magnesium Standard Solution
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SECTION I. MATERIAL IDENTIFICATION

Material Name: Magnesium Standard Solution

Description: SRM 3131a is a single element solution prepared gravimetrically to contain a nominal 10 mg/g of magnesium with a nitric acid volume fraction of 10 %.

Other Designations: **Magnesium** (magnesium metal) in **Nitric Acid** (aqua fortis; hydrogen nitrate; azotic acid; engraver's acid); **Magnesium Nitrate*** (magnesium salt; magnesium II nitrate) in **Standard Solution**

Name	Chemical Formulas	CAS Registration Numbers
Nitric Acid	HNO_3	7697-37-2
Magnesium Nitrate	$Mg(NO_3)_2$	10377-60-3
Magnesium	Mg	7439-95-4

DOT Classification: Nitric Acid, Solution, UN2031

Manufacturer/Supplier: It is available from a number of suppliers.

*The addition of magnesium to nitric acid, along with other intermediate chemical reactions, forms magnesium nitrate which will precipitate upon evaporation or drying of the solution.

SECTION II. HAZARDOUS INGREDIENTS

Hazardous Components	Nominal Concentrations (%)	Exposure Limits and Toxicity Data
Nitric Acid	10	ACGIH TLV-TWA: 2 ppm or 5 mg/m^3
		OSHA TLV-STEL: 4 ppm or 10 mg/m^3
		Human, Oral: LD_{LO}: 430 mg/kg
Magnesium Nitrate	6.1	ACGIH TLV-TWA: 2 mg/kg or 5 mg/m^3
		Rabbit, Skin: 500 mg/24 h (mild skin irritation)
		Rabbit, Eye: 500 mg/24 h (mild eye irritation)
		Rat, Oral: LD_{50}: 5440 mg/kg
Magnesium	1.0	No TLV-TWA established

SECTION III. PHYSICAL/CHEMICAL CHARACTERISTICS

Nitric Acid	Magnesium Nitrate	Magnesium
Appearance and Odor: a white to slightly yellow liquid that darkens to a brownish color upon aging and exposure to light; pungent odor	**Appearance and Odor:** hygroscopic solid	**Appearance and Odor:** an odorless, silvery white metal
Relative Molecular Mass: 63.02	**Relative Molecular Weight:** 148.33	**Relative Atomic Mass:** 24.305
Density: 1.0543 (10 % nitric acid)	**Density:** 1.464	**Density (5 °C):** 1.7
Solubility in Water: soluble	**Solubility in Water:** soluble	**Solubility in Water:** reacts with water
Solvent Solubility: decomposes in alcohol	**Solvent Solubility:** soluble in alcohol and liquid ammonia; slightly soluble in concentrated nitric acid	**Solvent Solubility:** soluble in mineral acids and concentrated hydrogen fluoride; insoluble in alkali

NOTE: The physical and chemical data provided are for the pure components. Physical and chemical data for this magnesium/nitric acid solution do not exist. The actual behavior of the solution may differ from the individual components.

SECTION IV. FIRE AND EXPLOSION HAZARD DATA

Flash Point: N/A **Method Used:** N/A **Autoignition Temperature:** N/A

Flammability Limits in Air (Volume %): **UPPER:** N/A
LOWER: N/A

Unusual Fire and Explosion Hazards: Although nitric acid does not burn, it is a powerful oxidizing agent that can react with combustible materials to cause fires.

Extinguishing Media: Use extinguishing media that is appropriate to the surrounding fire. Use a water spray to dilute nitric acid and to absorb liberated oxides of nitrogen.

Special Fire Procedures: Fire fighters should wear a self-contained breathing apparatus (SCBA) with a full face piece in the pressure demand or positive mode and other protective clothing.

SECTION V. REACTIVITY DATA

Stability: **X** **Stable** ____ **Unstable**

Conditions to Avoid: Avoid contact with combustible and other incompatible materials.

Incompatibility (Materials to Avoid): Keep nitric acid away from organic materials, plastics, rubber, and some forms of coatings. Nitric acid is incompatible with chlorine and metal ferrocyanide. Magnesium nitrate is incompatible with combustible materials, reducing agents, acids, and metal salts. Magnesium is incompatible with combustible materials, acids, metals, oxidizing agents, metal salts, halo carbons, cyanides, halogens, peroxides, and metal oxides.

See Section IV: *Unusual Fire and Explosion Hazards*.

Hazardous Decomposition or Byproducts: Hazardous decomposition of nitric acid can produce various nitrogen oxides, including nitric oxide (NO), nitrogen dioxide (NO_2), nitrous oxide (N_2O), as well as nitric acid mist or vapor. Thermal decomposition of magnesium

nitrate may release toxic oxides of nitrogen. Thermal decomposition of magnesium may release toxic and/or hazardous gases.

Hazardous Polymerization: _____ **Will Occur** __X__ **Will Not Occur**

SECTION VI. HEALTH HAZARD DATA

Route of Entry: __X__ **Inhalation** __X__ **Skin** __X__ **Ingestion**

Health Hazards (Acute and Chronic): Nitric Acid: Nitric acid may be fatal if inhaled, swallowed, or absorbed through the skin. This material causes burns and is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin. Inhalation may be fatal as a result of spasm, inflammation, and edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting.

Magnesium Nitrate: Inhalation of magnesium nitrate may cause irritation of the mucous membranes of the respiratory tract with symptoms of coughing and chest discomfort. Skin and eye contact may cause irritation with redness and pain. Repeated or prolonged exposure may cause dermatitis or conjunctivitis. If ingested, magnesium salts are poorly absorbed and rarely cause toxic effects other than possible gastrointestinal irritation with purging. However, accumulation may be sufficient to produce toxic effects if renal or intestinal function is impaired. Massive doses may cause vomiting, diarrhea, irregular heartbeat, symptoms of drunkenness, and coma. Fatalities are rare but have been reported after ingestion of doses as little as 30 g of magnesium ions. Magnesium ions are damaging to the heart muscle and pathological findings have shown hemorrhagic gastroenteritis. Repeated or prolonged exposure to nitrates may cause anemia, nephritis, and methemoglobinemia.

Magnesium: Magnesium is harmful if swallowed. This material causes irritation of the skin, eyes, mucous membranes, and upper respiratory tract. Inhalation of magnesium fumes may cause metal fume fever with cough, headache, fever, chills, sneezing, nausea, vomiting, dyspnea, chest pain, and leukocytosis. Ingestion may result in digestive disorders.

Medical Conditions Generally Aggravated by Exposure: Nitric acid may aggravate eye disorders, respiratory disorders, skin disorders, and allergies. Magnesium nitrate may aggravate kidney disorders.

Listed as a Carcinogen/Potential Carcinogen:

	Yes	No
In the National Toxicology Program (NTP) Report on Carcinogens		X
In the International Agency for Research on Cancer (IARC) Monographs		X
By the Occupational Safety and Health Administration (OSHA)		X

EMERGENCY AND FIRST AID PROCEDURES:

Skin Contact: Remove contaminated shoes and clothing. Rinse affected area with large amounts of water followed by washing the area with soap and water. Watch for chemical irritations and treat them accordingly. Obtain medical assistance if necessary.

Eye Contact: Immediately flush eyes, including under the eyelids, with copious amounts of water for at least 15 min. Obtain medical assistance if necessary.

Inhalation: If inhaled, move the victim to fresh air. If breathing is difficult, give oxygen; if the victim is not breathing, give artificial respiration. Obtain medical assistance.

Ingestion: If ingestion occurs, wash out mouth with water. **DO NOT** induce vomiting. If the exposed person is responsive, give one or two glasses of milk or water to drink. Obtain medical assistance if necessary.

NOTE (Nitric Acid): Wash affected skin areas with 5 % solution of sodium bicarbonate ($NaHCO_3$). If ingested, the risk versus the benefit of the passage of a naso-gastric tube is debatable. Activated charcoal is of no value. **DO NOT** give the exposed person bicarbonate to neutralize the material.

TARGET ORGAN(S) OF ATTACK:
Nitric Acid: Skin, teeth, eyes, and upper respiratory tract
Magnesium Nitrate: Blood, central nervous system, cardiovascular and respiratory system
Magnesium: Digestive and respiratory system

NOTE: Preplacement and annual medical examinations with emphasis on respiratory tract, skin irritations, dental erosion, and lung function tests should be provided for workers frequently exposed to nitric acid.

SECTION VII. PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken in Case Material Is Released or Spilled: Notify safety personnel, provide adequate ventilation and eliminate all sources of ignition immediately in case contact with metals should produce highly flammable hydrogen gas. Cleanup personnel need protection against contact with and inhalation of nitric acid. Use water sprays to direct nitric acid away from incompatible chemicals. Surfaces contaminated with spills should be covered with soda ash or sodium bicarbonate to neutralize the acid. Place the neutralized material into containers suitable for eventual disposal, reclamation or destruction.

Waste Disposal: Follow all federal, state, and local laws governing disposal.

Handling and Storage: The nitrogen oxides produced from the acid are all toxic; nitric acid itself is corrosive. Neoprene gloves and body shields should be used where splashing may occur. Chemical safety showers and eyewash stations must be readily available. Workers must receive training before handling nitric acid in the workplace.

NOTE: Contact lenses pose a special problem; soft lenses may absorb irritants and all lenses concentrate them. **DO NOT** wear contact lenses in the laboratory.

Store in a cool, dry, well-ventilated area away from incompatible materials, such as strong bases, metal powders, carbides, sulfides, and other readily oxidizable material. Protect containers from physical damage.

SECTION VIII. SOURCE DATA/OTHER COMMENTS

Sources: MDL Information Systems, Inc. MSDS *Nitric Acid*, June 2, 1999.
MDL Information Systems, Inc. MSDS *Magnesium Nitrate*, September 10, 1998.
MDL Information Systems, Inc. MSDS *Magnesium*, June 2, 1999.
The Merck Index, 11th Ed., 1989.
The Sigma-Aldrich Library of Chemical Safety Data, Ed. II, 1988.

Disclaimer: Physical and chemical data contained in this MSDS are provided only for use in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data on the MSDS. The certified value for this material is given on the NIST Certificate of Analysis.